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REPORT OF THE COMMITTEE ON NEW AND RENEWABLE SOURCES OF ENERGY AND ON ENERGY FOR DEVELOPMENT ON ITS SPECIAL SESSION*

(6-17 February 1995)

* The present document is a mimeographed version of the report of the Committee on New and Renewable Sources of Energy and on Energy for Development on its special session. The final report will be issued as Official Records of the Economic and Social Council, 1995, Supplement No. 5 (E/1995/25).

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Chapter I

MATTERS CALLING FOR ACTION BY THE ECONOMIC AND SOCIAL COUNCIL

The Committee on New and Renewable Sources of Energy and on Energy for Development was unable to complete the consideration of items 3 (Biomass for energy) and 4 (Development of energy resources in developing countries) at its special session and decided to consider them at its second session. The Committee therefore recommends to the Economic and Social Council the adoption of the following draft decision, revising the provisional agenda for the second session of the Committee, which was approved by the Council in decision 1994/310:

Report of the Committee on New and Renewable Sources of Energy and on Energy for Development on its special session and provisional agenda and documentation for the second session of the Committee

The Economic and Social Council:

(a) Takes note of the report of the Committee on New and Renewable Sources of Energy and on Energy for Development on its special session;

(b) Approves the revised provisional agenda for the second session of the Committee set out below.

PROVISIONAL AGENDA AND DOCUMENTATION FOR THE SECOND SESSION OF THE COMMITTEE ON NEW AND RENEWABLE SOURCES OF ENERGY AND ON ENERGY FOR DEVELOPMENT

1. Election of officers.

2. Adoption of the agenda and organization of work.

3. Follow-up to the first and special sessions of the Committee.

Documentation

Report of the Secretary-General on the follow-up to the first and special sessions of the Committee

4. Energy and sustainable development:

(a) Renewable sources of energy, with special emphasis on biomass: progress, policies and coordination;

(b) Development of energy resources in developing countries;

Documentation

Report of the Secretary-General containing an update of energy exploration and development trends in developing countries

(c) Energy and protection of the atmosphere.

Documentation

Report of the Secretary-General on energy and protection of the atmosphere

5. Medium-term planning and coordination in energy.

6. Other matters.

7. Provisional agenda for the third session of the Committee.

8. Adoption of the report of the Committee on its second session.

Chapter II

ENERGY FOR RURAL DEVELOPMENT

A. Recommendations of the Committee on New and Renewable Sources of Energy and on Energy for Development to the Commission on Sustainable Development

1. The Commission on Sustainable Development is requested to invite all States, entities within the United Nations system, other intergovernmental organizations and non-governmental organizations to consider, as appropriate, the following actions, on a priority basis:

(a) Not later than the year 2000, States that do not have national plans of action on energy for sustainable agriculture and rural development should review the energy situation in their rural areas and formulate as well as launch the implementation of such plans, following the suggestions of the Committee contained in the present report;

(b) In such national plans of action, special attention should be given to the sustainable development and efficient use of biomass as a source of energy. This implies, inter alia, promotion of the sustainable production of biomass for fuel and electricity and promotion of energy efficiency at both household and agro-industrial levels;

(c) Before the year 2000, a global initiative should be launched by the United Nations Development Programme (UNDP), the World Bank, the Global Environment Facility (GEF) and other interested organizations with the support of donor countries in order to facilitate the efforts of the developing countries to develop and implement a massive effort to bring electric power to the people in rural and isolated areas, based on successes already achieved in renewable energy technologies, such as photovoltaic, wind and mini-hydro;

(d) Before the year 2000, a global initiative should be launched by the World Meteorological Organization (WMO), the Food and Agriculture Organization of the United Nations (FAO), UNDP, the United Nations Environment Programme (UNEP) and other interested organizations, with the support of donor countries, to set up a combined programme to achieve detailed mapping of the potential of renewable energy sources, focusing on solar, wind and hydropower, as well as land resources for biomass energy, in order to facilitate the efforts of developing countries in those areas;

(e) To promote capacity-building, and with the help of donor countries, there should be established, on the initiative of the United Nations, a network of centres of excellence for environmentally sound energy technologies with a focus on energy and material efficiency improvement and on the development and demonstration of renewable energy sources. In order to accomplish this, existing national centres may be enhanced or, where needed, new centres of excellence created with the aim of achieving a regional role for each of them;

(f) To significantly advance energy for sustainable development and to stimulate coordination in energy, the United Nations should study in-depth ways and means of strengthening institutional arrangements within the United Nations system, including the possible establishment of a dedicated institution.

B. Introduction

2. The Committee welcomed the opportunity provided by the Economic and Social Council in its decision 1994/309 to hold a special session in order to provide advice on energy for rural development to the Commission on Sustainable Development at its third session (11-28 April 1995). The Committee noted that the objectives of programme area K, (Rural energy transition to enhance productivity) of chapter 14 (Promoting sustainable agriculture and rural development) of Agenda 21 1/ were:

(a) Not later than the year 2000, to initiate and encourage a process of environmentally sound energy transition in rural communities, from unsustainable energy sources to structured and diversified energy sources, by making available alternative new and renewable sources of energy;

(b) To increase the energy inputs available for rural household and agro-industrial needs through planning and appropriate technology transfer and development;

(c) To implement self-reliant rural programmes favouring sustainable development of renewable energy sources and improved energy efficiency.

3. The Committee noted that adequate energy inputs were required for raising standards of living and the productivity of human labour and for income-generation in rural areas in developing countries. To this end, rural energy policies and technologies should promote a mix of cost-effective options to improve the efficiency of energy consumption and the utilization of fossil and renewable energy sources.

4. During its deliberations, the Committee was keenly aware of the enormity of the problem and the great effort already made by many countries for the provision of energy to rural areas. Such an effort, however, had to be strengthened in the future. The Committee's recommendations therefore focused on the imperative for substantial action. In order to initiate and encourage the process called for in Agenda 21, the Committee concentrated on recommendations for sustainable energy in the rural areas of developing countries, including small island developing States, as appropriate.

C. Energy for rural development

1. Major problems of rural development

5. Rural development is the process of improving the welfare of rural peoples. This process has multiple facets, including social, economic and cultural ones. One of the more important of these is the raising of agricultural productivity. In the developed countries, economic development and industrialization were accompanied by enhanced agricultural productivity, leading to increased supplies of food and agricultural commodities. The resulting release of agricultural labour led to migration from rural areas, which provided the workers needed for the establishment and growth of the manufacturing sector and associated service industries.

6. These trends are also visible in a number of developing countries. The absolute value of agricultural gross domestic product (GDP) has been increasing, while its share of national GDP has been declining. During the period 1970-1990, the value of agricultural output increased from $224 billion to

$521 billion (1990 United States dollars), while its share of GDP declined from 24 per cent to 17 per cent.

7. The population of the world is expected to increase from the current 5.7 billion to 8.5 billion by the year 2025. In the developing world, the population is expected to increase from 4.5 billion to 7 billion during the same time period. The rural population would remain constant at around 3 billion. This means that about 90 per cent of the world's population growth will occur in the developing countries. Driven by the demand from a rapidly expanding urban population and by the need to improve the standard of living of rural people in developing countries, pressures for much higher agricultural output for both food and other commodities will increase substantially.

8. The Committee noted with concern that per capita income and productivity in the rural areas of the developing world remained low and that poverty was rampant. Income from agriculture was only $300 per capita. Numerous and often grave institutional shortcomings and the lack of basic infrastructure, such as energy and water supplies, transport and communications, all contributed to the problems faced by rural areas.

2. The importance of energy in solving problems of rural development

9. Although energy is not the only relevant factor for rural development, it is one of the prerequisites for improved agricultural and rural industrial productivity. The availability of energy has been vitally important in several successful efforts to improve productivity in agriculture. In India and other developing countries, it was found that modern energy in the form of electric and diesel pumps - in combination with other essential conditions - raised agricultural output by promoting innovation and making expansion of irrigation possible.

10. Energy also has a vital role to play in meeting the basic needs of rural households, such as lighting, and in improving the standard of living. Increased energy supplies can accelerate programmes related to water supply, health care, education, entertainment and communications. Through rural development, energy can also reduce the migration of people from rural to urban areas.

3. Present status and recent trends in rural energy conversion

11. Rural areas in the developing countries are, for the most part, dependent on draught animal power and traditional fuels, such as fuelwood and agricultural and animal wastes, for both household needs and their chief source of income, subsistence agriculture. Fuelwood use probably averages less than one cubic metre a year per capita. The efficiency of the conversion of the chemical energy of such materials to heat often runs only a few percentage points. Generally, income level is the most important variable governing the usage of [illegible] rural contexts, however, traditional fuels are garnered outside of market mechanisms. In these situations, their utilization is strongly influenced by the size of the population. Since population growth has been high in such regions, so too has the growth in the use of such fuels.

12. The concentration on fuelwood in the energy conversion pattern of developing countries has contributed to the progressive deforestation of rural

regions and a worsening of shortages of energy raw materials. In addition, considerable problems of air pollution from the unrestricted burning of such materials have arisen.

13. More modern technologies also play an important role in the rural energy usage of some developing countries. Coal and lignite are burned for space heating in the rural areas of many countries, liquefied petroleum gas and kerosene are used for cooking and lighting, diesel oil for operating internal combustion engines and coal and heavy fuel oil for industrial boiler and furnace firing. Coal, crude oil, residual fuel oil, and natural gas are employed for firing boilers associated with steam turbine electricity-generating plants when these are found in such areas. Hydropower is also available in many countries.

14. It is estimated that during the period 1970-1990, developing countries provided electricity to an additional 1.25 billion people in both urban and rural areas. Despite this very considerable effort, out of about 4 billion people in the developing world, nearly 2 billion, mostly in rural areas, are still without electricity. Most of the increase in people serviced with electricity was brought about by extension of the electricity grid. Recently, however, a variety of modern renewable energy sources have been called upon to contribute to rural energy supplies as well. Although these represent a rather small fraction of the total energy supply of the rural areas in developing countries at present, they offer good opportunities for considerable expansion of application and are discussed at length in section D below.

4. Present pattern of energy services in rural areas

15. Energy in the countryside, like energy in cities, is used to provide two broad classes of services - namely, as inputs into production processes and as objects of direct consumption by households. Thus, five broad classes of end-users can be identified: individual households, agriculture, trade and industry, community services and transport. The applications and conversion technologies associated with the various groups are shown in table 1.

16. Research has shown that in Africa, Latin America and Asia, 80 per cent of total rural energy consumption is absorbed by households (mainly for the preparation of food); 15 per cent is used for agriculture, trade and industries; and 5 per cent is consumed for transportation.

Table 1. Present rural energy needs and services

Consumer group	Application	Source/conversion technology
Individual households	Cooking	Wood, organic wastes
	Heating	Wood, organic wastes
	Cooling	Kerosene/gas refrigerators, generator sets, electricity
	Lighting	Candles, kerosene, gas, batteries, sometimes electricity
	Radio/TV	Batteries, sometimes generator sets, electricity
Agriculture	Tilling/mechanization	Animal/human power/liquid fuel
	Irrigation	Animal/human power, diesel or electric pumps
Trade and industry	Lighting	Kerosene, gas, generator sets, electricity
	Cooling	Kerosene/gas refrigerators, electricity
	Shaft power	Generator sets, human power, sometimes electricity
	Process heat	Wood, biomass residues, coal or bunker fuel
Community services	Lighting	Kerosene, gas, generator sets, electricity
	Drinking-water supply	Mechanical/electrical pumps
	Telecommunication	Diesel generator sets, electricity
Transport	Moving goods and persons	Liquid fuel, animal power

Source: Based on information provided by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, 1992.

5. Future patterns of energy services in rural areas

17. Looking to the future, if overall rural development is to proceed in the developing countries, then final energy conversion in productive uses must grow more rapidly than conversion in direct consumption by households. It should be emphasized here. Given the very low levels of per capita energy consumption in rural households in the developing countries at present, the absolute rise in residential energy consumption needs to be very rapid simply to satisfy basic human needs. However, a concomitant condition - indeed, a virtual prerequisite - is that the rate of increase of productive employment of energy be even more rapid. This condition is a practical necessity in order to support a rate of growth of

income adequate to provide the means to pay for the rapid expansion of residential energy consumption.

18. Shifts in the composition of aggregate output, along with changes in the relative magnitudes of the energy intensities associated with the various productive sectors, will determine the overall energy intensity of the production of goods and services in the developing countries over the next two decades. Developing countries need not accept long-run changes in product composition simply for reasons of reducing the overall energy intensity of aggregate production. The energy intensities of the various productive sectors are a different matter. They can be reduced by investment in the enhancement of the physical efficiency of energy conversion. The latter can, in turn, be promoted by judicious policy measures. Such measures are outlined in section F below.

19. However, not only will the pattern of energy end-use in developing countries change in the future, but the type of energy source utilized will also be transformed. Thus, as income rises in the developing countries in the future, there will be further substitution of fossil fuels for traditional ones, and sustainable policies should lead to leap-frogging towards an appropriate mix of fossil and renewable sources. Appropriate farming practices have to be applied to enhance and maintain high levels of productivity in the long term and to avoid or reduce the very large direct and indirect energy input historically used in developed countries for crop production.

D. Energy options

1. Energy and material efficiency

20. The potential contribution of improved efficiency in meeting growing needs for energy services in a sustainable way in the rural areas of developing countries can be substantial, especially at the point of end use, by introducing new, efficient, low-polluting technologies and systems and by upgrading existing, inefficient systems.

21. Coal and traditional fuels, such as fuelwood, charcoal, agro-waste and dung, are burned directly as domestic fuel for cooking and space heating, as well as for small-scale manufacturing processes carried out in rural areas. Inefficient technologies and low levels of technical and management skills result in low efficiency of energy use (typically 5 per cent to 18 per cent for cooking and water heating devices and stoves, depending on the fuel) and heavy indoor and local air pollution. Energy losses are high in utilization of farm machinery, including pumps for irrigation.

22. With regard to successful modernization programmes, the 140 million cookstoves project in China, as well as a similar programme in India already covering 17 million stoves, which improved efficiency up to a factor of 2, is worth noting. Other relevant projects in developing countries, supported by international institutions such as UNDP, FAO, GEF and the World Bank, aim at a more efficient use of energy and energy-intensive materials and at the recovery and recycling of materials through, for example the application of energy-efficient building technologies and materials; the use of cassava waste in biogas production; the recycling of paper, glass and other solid wastes; the use of more efficient methods of charcoal production; the improvement [illegible] vehicles and agricultural machines; and the recovery of methane from coal mines.

23. The challenge is to develop a strategy for facilitating and expediting the transition to the use of efficient agro-technologies, as well as to an appropriate mix of traditional, conventional and renewable sources of energy, in rural communities and economic activities presenting a variety of socio-economic settings.

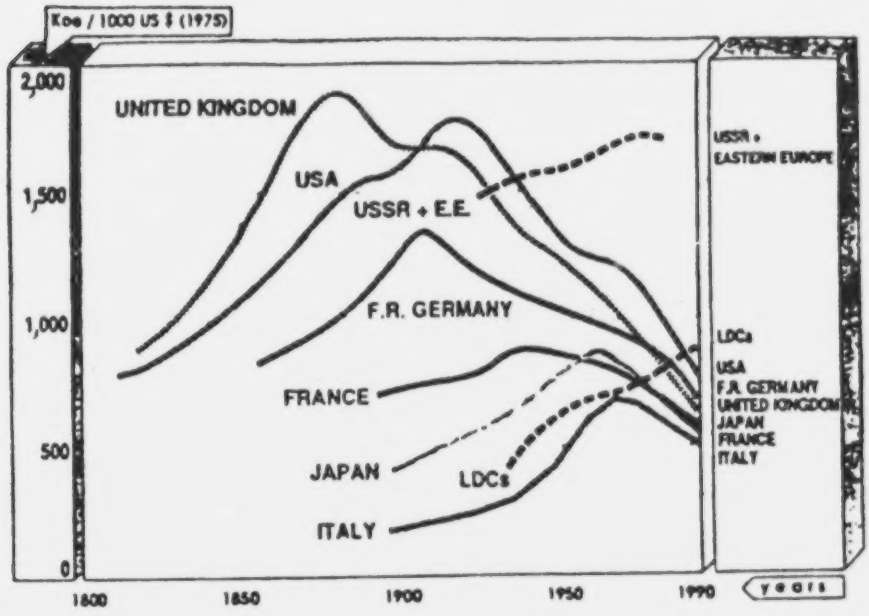
24. The present dynamics of commercial energy consumption as represented by the world-wide trend of energy intensity is not satisfactory. In particular, it is a matter of concern that the overall energy intensity in developing countries taken as a whole continues to increase even beyond the peak values reached in recent times by the more recently developed countries (see the figure). It is important to learn from past experiences and the opportunities offered by technological progress. Technological leapfrogging should be the preferred option as it would avoid the use of obsolete technology and encourage countries to adopt the best state-of-the-art technologies as part of their development strategies.

25. A number of technologies for increasing energy efficiency are not only available but also economically advantageous at today's energy prices. The priority is to accelerate the dissemination of these technologies by improving information, enhancing education, promoting capacity-building, removing regulatory, technical and legal barriers, facilitating credit, promoting the market mechanism and, when necessary, adapting or developing technologies to make them suitable to local conditions.

26. Technological improvements as well as demand side measures can apply to all fields of utilization, including the domestic and service sectors, industry, transportation, agriculture and power generation. Policies oriented to end-use rather than the supply-oriented policies that prevail today, could create opportunities for energy efficiency improvements.

Commercial energy intensity (E/GNP ratio) in some countries and groups of countries: historical trends

(Kilograms of oil equivalent per 1,000 1975 US dollars)



Source: U. Colombo, "The role of environmentally sound technologies in reducing greenhouse gas emissions", report prepared for the International Symposium on Environmentally Sound Energy Technologies and Their Transfer to Developing Countries and European Economies in Transition, Milan, Italy, 1991.

2. Renewables

27. Renewable energy technologies can be applied in a variety of ways to meet different types of final energy demand, as shown in table 2.

Table 2. Renewable energy technologies in rural areas

Technology	Main applications	Local conditions	Energy form
Biomass conversion	Cooking, lighting, heating, transport, power supplies	Steady supply of organic waste and biomass products	Heat/electricity/ liquid fuels
Mini-hydro	Decentralized power supplies, mechanical shaft power for cutting, milling, pressing etc.	Sufficient continuous water flow	Electricity/ mechanical
Solar thermal	Water heating, cooking and drying	Regular solar insolation	Heat/mechanical/ electricity
Photovoltaics	Decentralized power supplies for pumping, lighting, telecommunication and cooling	Regular solar insolation	Electricity
Wind	Water pumping, decentralized power supplies	Regular wind profile	Mechanical/ electricity
Geothermal	Greenhouse, heating, electricity supply, process heat	Appropriate geological formations	Heat, electricity

Source: Based on information provided by the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ) GmbH, 1992.

28. Until now, the demand for rural electrification has generally been met by the extension of the central grid or not at all. Experience, however, has shown the limitations of grid-based rural electrification programmes in developing countries. The provision of network electricity is often the most costly form of energy supply in rural areas. If its real costs were charged to users, it would be unaffordable for most of them. Therefore, an integrated approach combining the provision of rural electrical services and economic development is necessary. It has been demonstrated that the present demand for electricity can also be satisfied by a variety of other means, as described below.

29. Experience gained from pilot and demonstration projects in several developing countries shows that, in rural areas, renewable energy technologies can constitute a technically reliable, economically viable and environmentally friendly alternative. Rural energy demand analyses show that a combination of several energy technologies is often the best solution - for example, photovoltaics for lighting, communication and water pumping purposes; biogas for cooking, as well as solar cookers and coal, wood and charcoal burned in energy-saving stoves; wind power for water-supply systems; diesel generator sets for isolated village electrification; hydropower plants for electrical and mechanical power supply.

30. Although there has been an increase in the development and utilization of renewable sources of energy in some developing countries, on the whole the rate of increase has been slow.

31. The utilization of renewable energy sources may have some environmental impact but not comparable to that of fossil fuels. The character and level of the environmental impact will depend on the technologies used and, most important, on the procedures and practices employed. Generally, environmental and health problems associated with the prudent use and design of modern renewable energy technologies are much smaller than those associated with conventional energy sources. In particular, the use of most of the renewable technologies that are currently recommended does not result in net greenhouse-gas emissions, if adequate care is given to their deployment.

(a) Photovoltaic systems

32. Considerable progress has been made in the development and manufacture of photovoltaic (PV) systems. Cost reductions have been significant. It is widely expected that further technological development and mass production could reduce costs even further, thereby making the systems cost-competitive with other alternatives for wider applications. In 1994 the total world PV solar cell shipments were around 72 MW, 30 per cent of which was installed in the developing countries. Total PV solar cell shipments have quadrupled since 1985 and are currently valued at about $500 million a year.

33. Important PV-system configurations for rural electricity supply are central-station village power supply systems; solar home systems; battery-charging stations and portable solar lighting units. The central-station approach is more similar to the conventional option of setting up isolated grids, fed by diesel-powered generators. Thus, it also competes economically with diesel-based systems and - depending on the specific site and condition of use - can be cost-competitive, since the costs of electricity from small diesel generator systems may range from $1 to $2 per kWh. Solar home systems provide only a basic electricity supply. They do not compete with the classic electrification options, but rather with lighting oil, kerosene, candles, dry-cell batteries and car batteries.

34. The current market for PV is expected to increase dramatically if system costs can be brought down to $5 per peak watt. 2/ The prospects of further cost reductions, through technological research, are very promising.

35. Small domestic PV systems are now being used in some rural areas in developing countries. For example, 100,000 people in Indonesia are now served by electricity through small systems totalling 700 kW in remote areas at an average monthly cost of about $3.75 per household, approximately equivalent to the previous outlay for kerosene, candles and batteries. 3/ A number of other developing countries also have strong, if relatively small, programmes for the supply of kits for television and lighting, in which private-sector initiatives, including local manufacturing and assembly, have met with encouraging results. In many countries, such as Algeria, Brazil, China, India, Morocco, the Philippines, Mexico, Sri Lanka and Zimbabwe, PV use is increasing, especially for telecommunications and street lighting, as well as for domestic lighting and water pumping. Village-level PV power plants of a capacity in the range of 5-10 kW with their own distribution systems have been installed in developing countries, notably Brazil, India, Indonesia and Mexico. In many instances these have proved successful in terms of operation and maintenance at the village level, although there have been failures.

(b) Solar thermal energy conversion

36. Solar water-heating, solar drying and passive solar architecture are mature and widespread technologies. The market for solar water heaters is largely commercial in many countries. At least 3,000 MW (thermal) solar collectors are installed world wide. Solar drying is of significant importance for post-harvest drying and thus reduction of serious losses of agricultural and fish products. Other interesting options are solar cooking, sterilization, distillation, water desalination, refrigeration, solar process heat and direct solar water pumping.

37. Solar thermal electricity systems are technology options which either are not yet fully commercialized (parabolic dish, central receiver systems) or are relatively cost-intensive technologies for rural and agricultural development. Parabolic trough systems have demonstrated their capability to deliver power reliably to the grid. Their electricity production costs at present range from 13 to 20 United States cents per kWh.

(c) Wind energy

38. Wind energy can be used for electricity production, pumping and mechanical power. Large-scale electricity production (wind farms) has received much attention and has achieved some notable success. Globally installed wind-turbine capacity reached nearly 4,000 MW in 1994. That year, the increase in global installation of wind turbines was of the order of 600 MW. Among developing countries, Argentina, China, Egypt and India have established some wind farm capacity and this is increasing. In addition, there are over 100,000 windmill battery chargers and nearly 1 million wind pumps currently installed world wide, the latter serving mainly livestock and village water supply.

39. The ultimate potential of wind energy on a global basis is considerably higher than present world electricity production. This energy source is, however, site specific and intermittent. Technological developments have reduced costs by about 10 per cent a year during the past 15 years and considerable expansion of capacity is expected in both developed and developing countries.

(d) Biomass energy

40. In 1990, biomass accounted for at least 20 per cent of the total energy consumed in developing countries, most of which is in rural areas - 20 per cent in China, 33 per cent in Brazil and India, 50 per cent in Indonesia and the Philippines and over 75 per cent in most African countries south of the Sahara. It is estimated that biomass consumption in developing countries in 1990 was equivalent to about 900 million tons of oil, for a total value of $137 billion; this is 1.2 times the total oil consumed in the developing countries the same year. About 45 per cent of this biomass is wood (400 million tons of oil equivalent) which is used either directly or in the form of charcoal, not always produced in a sustainable manner. The rest is made up of agricultural residues and animal wastes. Biogas systems using other biomass feeds, such as dung, have been introduced in some countries on a massive and widespread scale but have had mixed results due to complex sociocultural factors. Biomass is also used to produce ethanol for transportation fuel. In Brazil, an extensive ethanol programme produced an amount that corresponds to 4.5 million tons of oil equivalent from sugar cane in 1992 at prices which would compete economically with crude oil priced at $24 a barrel. In some European countries, biomass accounts for 10 per cent to 15 per cent of primary energy consumption.

41. Research and development activities involving various aspects of biomass production, conversion and energy use have increased over the past 10 years. Investigations of fast-growing species, soil-water species relationships, harvesting techniques and equipment and conversion techniques (such as gasification, pyrolysis, liquefaction and carbonization) have taken place in several countries, including some developing countries. New developments in ethanol production include the use of genetically engineered bacteria to assimilate and ferment biomass. A promising concept for the conversion of biomass to electricity seems to be the biomass integrated gasifier/gas turbine plant.

42. According to some scenarios, sustainable biomass energy systems could be the largest single contributor to global energy supply, providing from 17 per cent to 35 per cent of the total demand for primary energy in 2050. Such a development would not occur under "business as usual" conditions but would derive from sustainability policies and technological advances with regard to liquid, solid and gaseous fuel production from biomass. Rural areas should be viewed as both consumers and producers of sustainable energy.

43. Biomass production, conversion and utilization offer important opportunities for rural employment, as exemplified by the 700,000 jobs created by the Brazilian alcohol programme. Biomass energy can serve as a basis for local agro-industrial development, for rural energy services and for power to the grid, as in the case of the sugar mills. In industrialized countries, the preservation of the social fabric of rural areas, where agricultural land set-aside programmes are jeopardizing economic existence, could be enhanced by replacing surplus agricultural production with energy crops. Biomass energy use can have a considerable impact on the local and global environment, such as rehabilitation of degraded lands, production of organic fertilizers, reduced emissions and treatment of wastes. With proper inter-cropping and/or multi-cropping techniques, biodiversity loss can be avoided.

44. In order to assess the viability of biomass energy systems, it is of the utmost importance to review the constraints and barriers to their utilization. Land availability for energy crops (forestry and agricultural) is a key point, since competition with land for food production should be avoided. Various assessments have been made in this respect, considering population and food production projections, yield trends, water availability and currently available degraded land, which amounts to around 700 million hectares. A study of the area under cultivation in 91 countries has shown that the present 706 million hectares will increase to 1,059 million by the year 2025, which represents only 40 per cent of the potential cropland. Nevertheless, at the regional level, Asia (without China) would have a deficit of 47 million hectares, while Africa and Latin America would have, respectively, 75 per cent and 77 per cent of their cropland still available. Detailed studies are being carried out in many countries, which will give a clearer picture of the availability of land for energy crops. Land and product ownership issues and legislation must also be taken into account.

(e) Hydropower

45. In terms of energy output, large-scale hydro energy is second only to biomass among renewable sources of energy. The economic development potential at current oil prices is estimated to be equivalent to present world electricity consumption. A great part of this potential is located in developing countries. In 1992 hydroelectric installed capacity represented about 23 per cent of all generating plants world wide. Small-scale hydropower stations (under 10 MW)

contributed approximately 4 per cent to that total production in 1991. The experience of China is an example of the widespread use of mini hydropower plants. As an efficient form of rural energy, small and mini hydropower plants have been playing an important role in the process of achieving rural electrification in China. At the end of 1992, total capacity in mini plants (under 20 kW) was 215 MW; they provided electric power to 591,000 families living in rural areas. Moreover, by the end of 1993, there were 60,000 small and mini hydropower stations in operation with a total capacity of over 17 GW, accounting for 10 per cent of China's total electric generation.

46. A number of large-scale hydro developments in developing countries are multipurpose: for electricity generation, irrigation, flood control and fishing. As a result many rural areas in those countries have benefited from such schemes. The development of small-scale hydropower resources can spur rural development, given their short gestation period, lower total capital requirements, and use indigenous capabilities. Small-scale hydropower resources do not require the same large infrastructure for exploitation. They have a large potential but are little surveyed.

(f) Other renewable energy sources

47. There are other renewable sources, such as geothermal, tidal, ocean thermal, wave energy and salinity gradient. While geothermal resources have been used in a number of countries - for example, China, El Salvador, India, Indonesia, Kenya, Mexico and the Philippines, their potential for rural areas is limited in the foreseeable future. Similarly, tidal, ocean thermal, salinity gradient and wave energy are expected to have hardly any practical applications in the near future, especially in the rural areas.

3. Fossil fuels

48. The share of fossil fuels (coal, oil, natural gas) in the rural energy picture differs widely among developing countries because of a variety of factors, including levels of development, land quality, density of population and availability of indigenous energy resources. Coal is widely used in China, India and a number of other developing countries, as well as in countries with economies in transition. Natural gas is less widely used although several developing countries have recently initiated programmes with considerable investments in expanding natural gas distribution systems but mainly for urban areas. Oil products, such as kerosene, liquefied petroleum gas and motor fuels, are used in households as well as in agriculture, agro-industries and transportation.

49. Fossil fuels, especially coal and oil and more recently natural gas, are widely used for electricity generation for both urban and rural areas. Isolated rural electrification plants are mostly based on diesel oil.

50. Economic development and increasing per capita incomes in rural areas may be expected to be accompanied by substantial increases in the consumption of fossil fuels not only in modernized agriculture and transportation but also in households, especially if prices in real terms remain as low as in recent years.

51. While efforts will have to be directed towards the application of more efficient and environmentally sound technologies for the reduction of pollution from such fuels at the exploration, production, transportation and utilization

stages, their increased utilization may well have positive environmental benefits through slowing down some deforestation and desertification.

52. By the year 2020, according to the scenario contained in the report of the Secretary-General on changing global energy patterns (E/C.13/1994/2, table 4), the share of the developing countries in world-wide fossil fuel consumption, which is currently estimated at 26 per cent, may reach 48 per cent. Most of this increase will be in urban areas, where most of the population growth will occur, with consequent heavy demands on food and energy supplies in the form of wood and charcoal from rural areas. In order to avoid even more serious and even catastrophic consequences for the rural environment and productivity, substantial increases in the use of fossil fuels for rural energy services will be unavoidable if modern renewable energy technologies cannot make a major contribution to the rural energy mix.

4. System aspects

53. Energy systems for rural areas should fulfil the criteria for reliable and on-demand service for applications related to water supply, health services, domestic use, education and communication services and small industries, for example. This often requires storage or back-up arrangements and can thus have cost implications. It also adds to the complexity of the system as a whole and therefore local capability to manage these systems is required. Local availability of spare parts and components or easy access to sources of supply of these items are important considerations in system reliability. Energy tariffs should be so designed as not to act as a deterrent to introducing and maintaining these systems i rural areas.

E. Constraints to market penetration

54. The main constraints to market penetration of energy in rural areas are in most cases the lack of purchasing power of the local population and/or the lack of financial resources of the local community or government for investments in infrastructure. Another constraint is the lack of sustained political commitment to, and support of, the process of enhanced productivity, economic growth and social equity in rural areas. This is often caused by a lack of long-term national energy strategies with the objective of balanced national economic and social development. Where such strategies exist they often ignore important local energy resources, such as biomass.

55. Limited national resources in many developing countries, especially as regards finance and highly trained personnel, are often devoted to centralized capital-intensive investment projects aiming at economies of scale and characterized by extensive transportation facilities. These efforts have prevented the development of localized small energy supplies and decentralized small energy systems.

56. Renewable sources of energy suffer in many cases because of the following constraints:

(a) The low world market price of fossil fuels in comparison with the relatively high cost of renewable sources of energy;

(b) The burden of the initial investment. A decisive difference between conventional and renewable energy systems is in the burden of the initial

investment. It is well known that investments in conventional electricity and fossil fuel production and supply are made either by Governments or by large industrial enterprises and the user is only required to pay for the actual energy consumed. In the renewable energy sector, the user is often asked to meet at least a part of the investment in the device, which also includes the energy generation or conversion component.

(c) The continuing and often built-in subsidy for conventional energy supplies. In almost no country in the world are farmers required to pay for the full cost of energy supply. Likewise kerosene is highly subsidized. Such subsidies are very often justifiable in the context of the need to assure energy for essential purposes and for increasing agricultural production. Nevertheless, they place renewable energy systems in an unfavourable position as far as the individual user is concerned;

(d) Weakness of institutions for commercializing renewable energy technologies. In many countries, scientific, engineering, manufacturing and financing capacities are non-existent or not adapted to their special needs. Private-sector initiatives are not encouraged enough.

F. A strategy for sustainable rural energy development

1. Development of national sustainable energy action programmes for agriculture and rural development

57. States Members of the United Nations are invited to develop and implement an integrated national action programme for the development of and transition to an energy system that allows socio-economic development to fulfil basic human needs and improve the quality of life, takes care of environmental concerns, guarantees security of supply and uses finite resources sparingly, in the interest of present and future generations. The programme should be developed and implemented through a coordinated effort of ministries, non-governmental organizations and private sector and other local organizations.

58. The programme should be oriented to demand rather than supply. In these programmes, strategies to be followed to realize a sustainable energy future should include the following elements:

(a) Improving energy and material efficiency;

(b) Developing local and indigenous energy resources, with an emphasis on renewables;

(c) Diversifying the mix of energy resources on which the national energy system depends.

59. The programme should include a plan of action to fulfil the need for energy services in rural areas. It should describe actions to be taken to create a reliable infrastructure for the development, exploration and expanded use of energy options to fulfil the needs. The plan of action should be placed in the context of local needs and the level of socio-economic development. Special attention should be given to the role of women, both as bearers of a large portion of the burden of underdevelopment at present and as agents of change.

60. Initiatives that are needed, such as rural electrification, social forestry and implementing renewable energy technologies, are only one piece of a more

complex puzzle to raise the level of development in rural areas. Therefore, strong coordination of activities in all sectors covering rural energy is required, including energy, forestry, agriculture and rural development. It also implies that a long-term commitment is required to achieve the successful development of rural energy projects.

61. The actions to be taken should be based on a detailed investigation, mapping and assessment of indigenous energy resources, including hydropower, wind and solar power, as well as evaluations of organic waste and land resources for biomass energy production. The assessments should include an investigation and evaluation of the environmental impact of utilizing these indigenous resources and the competition and conflict between alternative uses of land.

62. Goals should be set for the contribution of the different options to improve energy and material efficiency and to supply in a sustainable way the energy services that are required for different points of time in the future and in accordance with socio-economic development priorities.

63. In national programmes, attention should be also given to the creation of an optimized mixture of incentives to stimulate the development of a sustainable energy system, taking into account the following:

(a) In many countries, the potential for implementing a sustainable energy programme is limited severely by, for example, existing laws, regulations and disincentives; this situation should be changed;

(b) The greatest incentive to energy and material efficiency and to the expansion of renewable energy supplies would simply be the removal of subsidies for conventional sources of energy. For example, subsidies in the developing countries for electricity alone were estimated by the World Bank at $100 billion a year. 4/ Direct and indirect permanent subsidies for conventional sources of energy should be removed gradually. However, if social or other considerations do not permit the complete removal of such subsidies, the new environmentally sound technologies should receive corresponding financial support;

(c) Although permanent subsidies promote inefficiency, the wise use of temporary subsidies can help to promote research and development and to introduce new and environmentally sound technologies by creating initial markets;

(d) An important incentive would be to encourage prices that reflect the true costs of energy, in which factors that are now external to the pricing structure (inter alia, environmental and social costs and benefits) are internalized. Steps should be taken to ensure that these externalities are reflected in decision-making processes;

(e) As an additional incentive to the expansion of renewable energies, Governments should abolish import duties on renewable energy technologies as far as possible.

2. Priority-setting in rural energy development

64. A new look at the priorities and criteria governing rural energy development is needed. To achieve a sustainable rural energy system, the following areas should be considered for priority action, consistent with local needs and resources and supported with appropriate policies:

(a) Efficient conversion and use of energy. Regardless of the energy source, attention should be given to the efficient conversion and use of energy carriers in households (cooking, lighting and other energy services); agricultural mechanization (land preparation, harvesting, transport and soil fertilization); irrigation (including efficiency of water use); and food conservation and local manufacturing (process heat, cooling, drying);

(b) Biomass for energy. This should be viewed as an opportunity when formulating rural energy strategies. If managed properly, biomass fuels are renewable and environmentally benign. To assist with poverty alleviation and rural development, this indigenous renewable resource should be given much more attention. In many developing countries, it is an important fuel for urban areas and industry and a source of income for rural people. The importance of biomass to fulfil energy needs should be fully recognized; as a consequence, biomass energy should be included in all energy statistics;

(c) Rural electrification. While expansion of conventional electricity grids to serve rural areas will continue, a massive effort should be developed to install small-scale decentralized, renewable energy systems to bring electricity to the more than 2 billion people in the world who are now without it. Special attention should be given to the installation of solar home systems based on the use of photovoltaic modules, also providing jobs and economic development;

(d) Use of solar thermal energy. Many basic needs can be met by direct use of solar radiation, inter alia, for hot water supply, cooking, crop drying, water purification and water pumping. These options should receive more attention, because of their potential to save scarce fuels and their competitiveness under certain conditions;

(e) Exploration and application of fossil fuels. For at least many decades, fossil fuels will continue to play an essential role in rural development. Therefore, much attention should be given to the development and implementation of efficient and environmentally sound technologies for the exploration, production, transportation and utilization of fossil fuels in rural areas.

3. Capacity-building in rural energy development

65. Human resources are the basic building blocks of a nation's resources and of its capacity to carry out work in any specific substantive area. The development of a sustainable energy strategy should be implemented by providing the energy economy with a cadre of professionals who understand and can set policy and develop, design and implement energy programmes. In order to avoid the inefficient use and/or loss of specialized human resources, appropriate socio-economic conditions should be created.

66. Capacity-building should, inter alia, result in the more effective involvement of women in energy programmes and projects aimed at sustainable development in rural areas. Data collection and analyses are needed to permit evaluation of projects and monitoring of the progress made as a result of implementing rural energy development programmes.

67. Given the dispersed nature of usage, it is imperative that capabilities of local manufacture and servicing of renewable energy programmes are strengthened.

68. An important element in building up indigenous capacity should be the creation, on the basis of national and regional initiatives, of centres of excellence for environmentally sound energy technologies, especially in the field of energy and material efficiency improvement and renewable energy, to provide training, technology support and resource data appropriate to regional needs.

69. Capacity-building also means creating public awareness about the gravity of rural energy problems and the possibility of transforming these problems into opportunities. This requires, among other things, the availability at all levels - village-level users, national Governments, lenders and United Nations organizations - of more and better information about the potential for meeting the basic need of rural communities for energy services, opportunities for productivity enhancement through energy and material efficiency improvement, the development of renewable energy sources and the production and utilization of fossil fuels using environmentally sound technologies.

4. New directions in management and institutional arrangements

70. The world is witnessing expanding recourse to market mechanisms as devices for approximating a socio-economically efficient allocation of funds. In this context, Governments should develop activities and arrangements to ensure that such efficiency is achieved in practice. This can be achieved with advice from specialized institutions. Sustainability indicators for rural energy development should be progressively derived and integrated into planning and management efforts.

71. One of the more important measures which Governments should adopt to fulfil the energy needs of rural areas in a reliable, cost-effective and sustainable way is to pay increased attention to the efficient management of existing energy systems. This is especially true as regards electricity generation, distribution and consumption in rural areas.

72. Integrated resource planning and demand-side management, based on strengthened data collection efforts, should also be used as important tools to improve the utilization of energy. They can help set priorities and lead to least-cost mixes of implementing efficiency improvement, decentralized renewables, and centralized energy supply options.

73. Energy service companies, as third party investors, can play an important role in rural energy development. They may intervene for prefinancing the renewable energy equipment and/or the energy efficiency measures. In both cases, the energy consumers will continue to pay their old energy bills until the investment costs are met. Thereafter, the energy service companies will adjust their rates to the maintenance and operating costs only. In several countries, such arrangements have been made at the institutional level through public companies, thus enabling affordable monthly payments by users.

74. Another example of institutional arrangements is the successful rural cooperatives established in Bangladesh and Brazil, among other countries. Here, groups of current or prospective customers in isolated areas have organized electricity supply arrangements with the aid of government subsidized financing. Similarly, initiatives in the private sector could be encouraged.

5. New financial and investment arrangements

75. For development to take place in a significant way, capital investment on a large scale is needed in all sectors. The necessary levels of capital can only be assessed through greater involvement of the private sector. The terms and conditions that will attract private capital to sustainable development must be an ongoing policy concern, of Governments.

76. Multilateral financial institutions, such as the World Bank, GEF and the regional development banks, are called upon to increase financing (especially grants and credits) substantially for small-scale energy and energy efficiency projects in the rural areas of the developing countries.

77. Small-scale energy consumers in the developing world, who stand to benefit from small-scale renewable energy systems, should gain better access to affordable financing. The establishment of revolving funds for start-up financing of the purchase of these systems could be a strong instrument to solve this problem.

78. To initiate and encourage environmentally sound energy transition in rural communities not later than the year 2000, developed countries should increase their aid for investments in rural energy development in developing countries.

6. Accelerated development and implementation of new technologies

79. Governments, utilities, private companies and other institutions should accelerate the development and demonstration of promising new and sustainable energy technologies that are benign for rural development (see sects. C and D above). This includes investments in pilot projects whose aim would be to demonstrate promising new technologies and thereby hasten their commercialization. Small-scale modular energy technologies, such as photovoltaic solar energy conversion, and such technologies as modern biomass electricity production have significant development potential.

80. Newly industrialized economies have the opportunity to "leapfrog" old methods and unsustainable technologies directly to newer, more sustainable approaches. This could bring developing countries to the highest technological performance and institutional arrangements. It should be noted, however, that in many cases, implementation of these new technologies will require that they be adapted to the specific local conditions.

7. New international actions for rural energy development

81. The development and implementation of national sustainable energy policies and programmes in developing countries and small island developing economies should, on request, be supported by regional and international initiatives. Existing regional cooperative programmes, such as the African Energy Programme of the African Development Bank and the energy programmes of the Association of South-East Asian Nations, should be actively involved in providing that support.

82. The Committee noted with appreciation the progress made in sustainable energy development within the United Nations system. It supported the idea that UNDP and other organizations should work towards a joint international programme to accelerate the development of promising new energy technologies that could stimulate rural development. Those organizations could also make important

contributions to "leapfrogging" by providing support for the implementation of well-prepared, adequate and innovative energy demonstration projects.

83. New programmes aiming at rural energy development, such as the UNDP Initiative for Sustainable Energy and the FAO Bio-energy and Environment Assistance Programme (BEAP), should, when implemented, be supported by donors and financial institutions.

84. Important regional and international organizations active in the energy field should be called upon to assist in the solution of energy problems in rural areas. Examples of these organizations are The African Petroleum Producers Association, the Independent Petroleum Exporting Countries, the International Energy Agency, l'Institut de l'Energie des pays fracophones, the Latin American Energy Organization, the Organisation of Arab Petroleum Exporting Countries and the Organization of the Petroleum Exporting Countries.

85. Steps should be taken to promote the implementation of bilateral, multilateral and regional cooperation in the field of rural energy development, such as energy charters, joint ventures and joint projects, among industrialized countries and developing countries and among developing countries.

86. Environmentally sound energy technologies should be rapidly and effectively transferred to developing countries on favourable terms, including concessional and preferential terms, in order to stimulate sustainable agriculture and rural development.

87. The implementation of a standing proposal to establish a global network of international centres of excellence in the field of environmentally sound energy technologies should be encouraged.

8. Strengthening sustainable energy activities within the United Nations system

88. Energy activities within the United Nations system should be strengthened and coordinated to accelerate rural energy development. The Committee noted with great concern that in the field of energy, there was no practical coordination mechanism within the United Nations system at either the planning or the implementation stage. Many organizations had emphasized the need for coordinated policies, strategies and projects aimed at the sustainable development and supply of energy resources in rural, as well as urban areas. The Committee therefore made the following recommendations on actions to be taken by the Secretary-General:

(a) Coordinate the exchange of information and experience on research, development and application of energy technologies;

(b) Improve the exchange of information on energy activities within the United Nations system and, in this connection, consider the possibility of establishing a database on energy available to Member States;

(c) Improve the coordination of capacity-building in energy activities within the United Nations system and at the country level;

(d) Improve the coordination of energy programmes within the United Nations system at the stage of programme budget formulation;

(e) Make full use of the regional commissions and appropriate specialized agencies and programmes of the United Nations system in these coordination efforts;

(f) Strengthen the Division for Sustainable Development of the Department for Policy Coordination and Sustainable Development of the United Nations Secretariat and UNDP to improve the coordination of energy activities within the United Nations system at the planning and implementation stage;

(g) Study in-depth ways and means of strengthening institutional arrangements within the United Nations system to significantly advance energy for sustainable development, including the development of rural energy resources. In this study also, the possible establishment of a dedicated institution should be investigated. Such an institution might start with a mandate in the coordination of activities to promote the improvement of energy and material efficiency and the development and application of renewable sources of energy.

Notes

1/ Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.

2/ M. R. Bhagavan and others, Energy for Rural Development (London and Atlantic Highlands, New Jersey, Zed Books, 1992), p. 58.

3/ See the report of the Secretary-General containing an update on new and renewable sources of energy (E/C.13/1994/3), para. 17.

4/ Energy Efficiency and Conservation in the Developing World, World Bank Policy Paper (Washington, D.C., World Bank, 1993), p. 14.

Chapter III

ORGANIZATION OF THE SESSION

A. Opening and duration of the session

1. The Committee on New and Renewable Sources of Energy and on Energy for Development held a special session at United Nations Headquarters from 6 to 17 February 1995, in accordance with Economic and Social Council decision 1994/309. By that decision, the Council decided that the Committee should hold a session in February/March 1995 in order to provide advice on energy for rural development to the Commission on Sustainable Development at its third session, as provided for in Agenda 21. 1/ The Committee held nine meetings (1st to 9th) and a number of informal meetings.

2. The special session was opened by the Chairman, Mr. Mohamed M. Shawkat (Egypt).

3. At the 1st meeting, on 6 February, the Under-Secretary-General for Policy Coordination and Sustainable Development made an introductory statement.

4. At the 8th meeting, on 13 February, the Director of the Division for Sustainable Development of the Department for Policy Coordination and Sustainable Development made a statement.

B. Attendance

5. The following experts members of the Committee were present: Mr. Marcelino K. Actouka, Mr. Messaoud Boumaour, Mr. José L. Bozzo, Mr. Bernard Devin, Mr. Paul-Georg Gutermuth, Mr. Wolfgang Hein, Mr. José Fernando Isaza, Mr. Virgil Musatescu, Mr. Valeri Nikov, Mr. Giovanni C. Pinchera, Mr. Zoilo Rodas Rodas, Mr. E. V. R. Sastry, Mr. Mohamed M. Shawkat, Mr. Wilhelmus C. Turkenburg, Mr. Dmitri B. Volfberg and Mr. Zhang Guocheng.

6. The following States Members of the United Nations were represented: Haiti and Ireland.

7. The following United Nations bodies and programmes were represented: United Nations Development Programme, United Nations Environment Programme and International Research and Training Institute for the Advancement of Women.

8. The following specialized agencies were represented: Food and Agriculture Organization of the United Nations, United Nations Educational, Scientific and Cultural Organization, World Bank, World Meteorological Organization and United Nations Industrial Development Organization.

9. The International Energy Agency of the Organisation for Economic Cooperation and Development, an intergovernmental organization, was also represented.

10. The following non-governmental organizations in consultative status with the Economic and Social Council (Roster) were represented: International Solar Energy Society and Solar Cookers International.

C. Election of officers

11. The officers, who had been elected by the Committee at its first session remained (with the exception of Mr. Thomas B. Johansson (Sweden), who had resigned):

Chairman: Mr. Mohamed M. Shawkat (Egypt)

Vice-Chairmen: Mr. Zhang Guocheng (China)
Mr. Zoilo Rodas Rodas (Paraguay)

Rapporteur: Mr. Virgil Musatescu (Romania)

12. At the 2nd meeting, on 6 February, the Committee elected, by acclamation, Mr. Wilhelmus C. Turkenburg (Netherlands) Vice-Chairman.

D. Agenda

13. At the 1st meeting, on 6 February, the Committee adopted the provisional agenda for the special session contained in document E/C.13/1995/1 and Corr.1. The agenda was as follows:

1. Adoption of the agenda and organization of work.

2. Energy for rural development.

3. Biomass for energy.

4. Development of energy resources in developing countries.

5. Energy coordination.

6. Adoption of the report of the Committee on its special session.

14. At the 2nd meeting, on 6 February, the Committee adopted its programme of work contained in document E/C.13/1995/L.1.

E. Consideration of agenda items 2 to 5

1. Energy for rural development

15. The Committee considered agenda item 2 at the 2nd to 8th meetings, from 6 to 13 February. It had before it a number of informal papers submitted by individual members of the Committee. The Secretariat made a number of background papers available to the Committee.

16. Statements were made by Mr. Actouka, Mr. Boumaour, Mr. Bozzo, Mr. Devin, Mr. Gutermuth, Mr. Hein, Mr. Isaza, Mr. Musatescu, Mr. Nikov, Mr. Pinchera, Mr. Rodas Rodas, Mr. Sastry, Mr. Shawkat, Mr. Turkenburg, Mr. Volfberg and Mr. Zhang.

17. Statements were made by the representatives of the United Nations Development Programme and the International Research and Training Institute for the Advancement of Women.

18. Statements were also made by the representatives of the Food and Agriculture Organization of the United Nations, the United Nations Educational, Scientific and Cultural Organization and the World Meteorological Organization.

19. Statements were also made by representatives of the International Energy Agency of the Organisation of Economic Cooperation and Development.

20. Statements were made by the observers for Solar Cookers International and the International Solar Energy Society, non-governmental organizations in consultative status with the Economic and Social Council (Roster).

2. Biomass for energy

21. The Committee considered agenda item 3 at the 5th, 6th and 9th meetings, on 8, 9 and 17 February. Consideration of the item focused on the sustainable use of biomass as a source of energy and income in rural areas.

22. Statements were made by Mr. Boumaour, Mr. Bozzo, Mr. Devin, Mr. Gutermuth, Mr. Hein, Mr. Isaza, Mr. Pinchera, Mr. Turkenburg, Mr. Volfberg and Mr. Zhang.

23. The representative of the Food and Agriculture Organization of the United Nations made a statement.

3. Development of energy resources in developing countries

24. The Committee considered agenda item 4 at the 9th meeting on 17 February.

25. The Chairman made a statement.

4. Energy coordination

26. The Committee considered agenda item 5 at a number of informal meetings in the context of energy for rural development and at the 9th meeting on 17 February.

27. The chairman made a statement.

F. Adoption of the report of the Committee on its special session

28. At the 9th meeting, on 17 February, the Committee adopted the report on its special session (E/C.13/1995/L.2), as orally revised.

Notes

1/ Report of the United Nations Conference on Environment and Development, Rio de Janeiro, 3-14 June 1992, vol. I, Resolutions Adopted by the Conference (United Nations publication, Sales No. E.93.I.8 and corrigendum), resolution 1, annex II.